## CLAIMS

1. A system for generating shaped ultra wideband wavelets, comprising:

a differential mixer having a first input, a second input and an output, said second input being a differential input having a first differential input and a second differential input, said first input being configured to receive non-return-to-zero data from a source; and

a pulse generator configured to generate a pulse sequence having at least two pulses in a predetermined pattern, wherein

at least one of said at least two pulses being input to the first differential input, and another one of said at least two pulses being input to the second differential input, and

said differential mixer being configured to provide said shaped ultra wideband wavelets at said output of said differential mixer.

2. The system of Claim 1, wherein:

at least one of said first input and said output of said differential mixer being a differential terminal.

3. The system of Claim 1, wherein:

the first input and the second input of said differential mixer being configured to receive digital waveforms.

4. The system of Claim 1, wherein:

the differential mixer being a Gilbert cell mixer.

5. The system of Claim 1, wherein:

the differential mixer being a FET bridge mixer.

6. The system of Claim 1, wherein:

the differential mixer being a diode bridge mixer.

7. The system of Claim 1, wherein:

said pulse sequence comprises an early pulse and a late pulse, said late pulse being applied to said differential mixer after said early pulse;

said early pulse being input to said first differential input of said differential mixer and said late pulse being input to said second differential input of said second input; and

said shaped ultra wideband wavelets being bi-phase wavelets.

8. The system of Claim 7, wherein:

said first input being configured to receive non-return-to-zero data that includes multi-level non-return-to-zero data pulses, having at least two amplitude levels; and

said shaped ultra wideband wavelets being multi-level bi-phase wavelets.

9. The system of Claim 8, further comprising:

a digital-to-analog converter configured to receive said data and set an amplitude level of a waveform applied to the first input, said amplitude level corresponding to a value of said data.

10. The system of Claim 7, wherein:

said pulse sequence comprises a multi-level pulse sequence, having at least two amplitude levels; and

said shaped ultra wideband wavelets being multi-level bi-phase wavelets.

11. The system of Claim 10, further comprising:

a digital-to-analog converter configured to receive said data and set an amplitude level of a waveform applied to the first input, said amplitude level corresponding to a value of said data.

12. The system of Claim 1, wherein:

said pulse sequence comprises an early pulse, a mid pulse occurring behind said early pulse, and a late pulse occurring behind said mid pulse,

said mid pulse being applied to said first differential input of said differential mixer and said early pulse and said late pulse being applied to said second differential input of said differential mixer, and

said shaped ultra wideband wavelets being quad-phase wavelets.

13. The system of Claim 12, wherein:

said first input being configured to receive non-return-to-zero data that includes multi-level non-return-to-zero data pulses, having at least two amplitude levels; and

said shaped ultra wideband wavelets being multi-level quad-phase wavelets.

14. The system of Claim 12, further comprising:

a digital-to-analog converter configured to receive said data and set an amplitude level of a waveform applied to the first input, said amplitude level corresponding to a value of said data.

15. The system of Claim 12, wherein:

said pulse sequence comprises a multi-level pulse sequence, having at least two amplitude levels, and

said shaped ultra wideband wavelets being multi-level quad-phase wavelets.

16. The system of Claim 15, further comprising:

a digital-to-analog converter configured to convert at least one data bit into said at least two amplitude levels.

17. The system of Claim 1, further comprising:

a second differential mixer having a first input, a second input and an output, said second input is a differential input having a first differential input and a second differential input, said first input of said second differential mixer being configured to receive non-return-to-zero data from the source;

a second pulse generator configured to generate a second pulse sequence having at least two pulses in a second predetermined pattern; and

a summer having a first input, a second input and an output, wherein

at least one of said at least two pulses generated by said second pulse generator being input to the first differential input of said second input of said second differential mixer, and a different at least one of said at least two pulses being input to the second differential input of said second input of said second differential mixer,

said output of said differential mixer being applied to said first input of said summer and said output of said second differential mixer being applied to said second input of said summer, and

said shaped ultra wideband wavelets being output at said output of said summer and each of said shaped ultra wideband wavelets being one of a constellation of multi-amplitude and multi-phase shapes corresponding to a data value of the data.

18. The system of Claim 17, further comprising:

a look-up table having an input, a first output, and a second output, the input being configured to receive non-return-to-zero data from the source;

a first digital/analog converter having an input and an output, the input being connected to the first output of the look-up table, and the output being connected to the first input of the differential mixer; and

a second digital/analog converter having an input and an output, the input being connected to the second output of the look-up table, and the output being connected to the first input of the second differential mixer.

19. The system of Claim 1, further comprising:

a switch having a first input port, a second input port, an output port, and a control input having a first setting and a second setting; and

a second pulse generator configured to generate a second pulse sequence having at least two pulses in a second predetermined pattern, wherein

a portion of the data from the source being coupled to the control input of the switch,

the pulse sequence is coupled to the first input port of the switch,

the second pulse sequence is coupled to the second input port of the switch,

at least one of the at least two pulses generated by the pulse generator is input to the first differential input of the differential mixer, and another at least one of the at least two

pulses generated by the pulse generator is input to the second differential input of the differential mixer when the control input is set to the first setting,

at least one of the at least two pulses generated by the second pulse generator is input to the first differential input of the differential mixer, and another at least one of the at least two pulses generated by the second pulse generator is input to the second differential input of the differential mixer when the control input is set to the second setting, and

the shaped ultra wideband wavelets being output at the output of the differential mixer being one of a constellation of multi-amplitude and four-phase shapes corresponding to a data value of the data.

20. The system of Claim 19, further comprising:

a look-up table having an input, a first output, and a second output, the input being configured to receive non-return-to-zero data from the source, and the first output being connected to the first input port of the switch;

a digital/analog converter having an input and an output, the input being connected to the second output of the look-up table, and the output being connected to the first input of the differential mixer; and

the shaped ultra wideband wavelets being output at the output of the differential mixer being one of a constellation of multi-amplitude and four-phase shapes corresponding to a data value of the data.

21. The system of Claim 1, further comprising:

an encoder configured to encode a bit of data into a plurality of bits corresponding to a code, wherein

the plurality of bits corresponding to the code represents a first data value, and

an inverted version of the plurality of bits corresponding to the code represents a second data value.

22. A method for generating shaped ultra wideband wavelets, comprising the steps of:

encoding data from a data source as a non-return-to-zero sequence of pulses;

generating a pulse sequence having at least two pulses, and having a predetermined pattern; and

mixing the non-return-to-zero sequence of pulses with the pulse sequence to produce a sequence of shaped ultra wideband wavelets, each wavelet having a predetermined shape having the data encoded therein.

23. The method of Claim 22, wherein at least one of the at least two pulses is input to a first differential input of a mixer, and another one of the at least two pulses is input to a second differential input of the mixer.

24. The method of Claim 23, wherein:

the pulse sequence comprises an early pulse and a late pulse, the late pulse being applied to the mixer after the early pulse;

the early pulse is input to the first differential input of the mixer and the late pulse is input to the second differential input of the mixer; and

the shaped ultra wideband wavelets are bi-phase wavelets.

25. The method of Claim 24, wherein:

the non-return-to-zero sequence of pulses comprises a multi-level non-return-to-zero sequence of pulses having at least two amplitude levels; and

the shaped ultra-wideband wavelets are multi-level bi-phase wavelets.

26. The method of Claim 24, wherein:

the pulse sequence comprises a multi-level pulse sequence having at least two amplitude levels; and

the shaped ultra wideband wavelets are multi-level bi-phase wavelets.

27. The method of Claim 23, wherein:

the pulse sequence comprises an early pulse, a mid pulse occurring after the early pulse, and a late pulse occurring behind the mid pulse;

the mid pulse is input to the first differential input of the mixer and the early pulse and the late pulse are input to the second differential input of the mixer; and

the shaped ultra wideband wavelets are quad-phase wavelets.

28. The method of Claim 27, wherein:

the non-return-to-zero sequence of pulses comprises a multi-level non-return-to-zero sequence of pulses having at least two amplitude levels; and

the shaped ultra-wideband wavelets are multi-level quad-phase wavelets.

29. The method of Claim 27, wherein:

the pulse sequence comprises a multi-level pulse sequence having at least two amplitude levels; and

the shaped ultra wideband wavelets are multi-level quad-phase wavelets.

30. The method of Claim 22, further comprising the steps of:

generating a second pulse sequence having at least two pulses, and having a predetermined pattern;

mixing the non-return-to-zero sequence of pulses with the second pulse sequence;

summing the result of mixing the non-return-to-zero sequence of pulses with the pulse sequence with the result of mixing the non-return-to-zero sequence of pulses with the second pulse sequence to produce a constellation of multi-amplitude and multi-phase shapes corresponding to a data value of the data.